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OF

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No. 29.] MAY. [1889.

XCII.—PERSIAN ZALIL.

(*Delphinium Zalil*, Aitchison and Hemsley.)

With Plate.

The following interesting account of the Persian dye plant *Zalil* has been prepared by Sir Joseph Hooker for the April number [tab. 7049] of the *Botanical Magazine*. The plant was first described [Transactions of the Linnean Society, ser. 2, vol. iii., p. 30, t. 3] in the report "on the Botany of the Afghan Delimitation Commission," which was worked up at Kew from the remarkable collections made by Surgeon-Major Aitchison, C.I.E., F.R.S., when on duty as naturalist attached to the mission.

The Zalil flowered at Kew in July of last year, and specimens of the flowers as used for dyeing purposes and for medicine are in the Museums of Economic Botany. By the courtesy of Messrs. Lovell, Reeve, and Co. a reproduction of the drawing of the plant is included here with the description :—

"As a plant of economic value this is one of the most interesting discoveries of the Afghan Delimitation Commission, and our knowledge

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of it is due to the fact that the Indian Government directed a competent botanist, Dr. Aitchison, F.R.S., to accompany that important geographical operation. In the work cited above Dr. Aitchison (p. 31) thus describes the Persian Zalil, 'This plant forms a great portion of 'the herbage of the rolling downs of the Badghis, in the vicinity of 'Gulran it was of great abundance, and when in blossom gave a 'wondrous golden hue to the pastures. In many localities in Khorasan 'above 3,000 feet it is equally common. The flowers are collected 'largely for exportation, chiefly to Persia, for dyeing silk; they are 'also exported from Herat, through Afghanistan to Northern India, to 'be employed as a dye, as well as to be used in medicine.' In another place (p. 20) Dr. Aitchison, speaking of the vegetation of Badghis, says, 'For a short period the hillocks are tinted an exquisite blue by the 'flowers of *Gentiana Olivieri*, which is, as Boissier noted, a hot country 'Gentian. This is followed by *Delphinum Zalil*, a perennial, which 'throws up a spike of bright yellow blossom, two feet in height. Its 'showy blossoms suddenly cover the downs, which they illuminate with 'their brilliant colouring, affording a sight never to be forgotten.'

"The fact of *D. Zalil* affording a dye stuff is one of the many evidences of our ignorance of the materials used in the industrial arts of the East. It is reasonable to suppose that the flowers have been an article of commerce for ages, and yet I am unable to find any allusion to the subject in books devoted to the Economic Botany of India or to its manufactures. It is to be hoped that this may meet the eye of some intelligent official in the British Indian service who might ascertain to what purpose the important Zalil is put.

D. Zalil does not accord well with any section of *Delphinastrum*, as these are defined by Boissier. Regel, who was consulted as to its affinity, and whose knowledge of Oriental plants is unquestioned, pronounced it to be possibly *D. ochroleucum*, a Soongarian species, reduced by Boissier (vol. i., p. 89) to a form of the polymorphous *D. hybridum*, which has white, blue, and scarlet flowers; but that species belongs to the division with a dilated base of the petiole, with the lower petals equalling or exceeding the sepals, and with other discordant characters; yet I know no nearer affinity.—J. D. Hooker."

Figs. 1 and 2, petals; Fig. 3, carpels; all enlarged.

XCIII.—TASMANIAN WOODS.

The Colony of Tasmania was not represented at the Colonial and Indian Exhibition held in London in 1886, and hence there is no mention made of its products in the Reports prepared for the Royal Commission.

It was felt that as regards the timbers of Tasmania, as well as its numerous other natural products, this was a distinct loss to the Colony. Recently an effort was made to send to this country and submit to a practical test the most promising of Tasmanian woods on the same lines as the tests applied to the woods shown at the Colonial and Indian Exhibition. These tests were undertaken by Mr. Allen Ransome of Chelsea, who has prepared the following Report, which has been kindly communicated to Kew by the courtesy of Mr. E. N. C. Braddon, Agent-General for Tasmania, for publication in the *Bulletin*.

The woods of Tasmania are for the most part represented by fine specimens in the Timber Museum of the Royal Gardens (Museum No. III.).

Mr. A. RANSOME to AGENT-GENERAL FOR TASMANIA.

SIR, Chelsea, November 23rd, 1888.

I THANK you for your letter of the 1st instant, giving me a list of the Tasmanian woods forwarded to Stanley Works for trial some time since, and have now the pleasure to enclose my report on the same.

I regret that from the very unseasoned state of the timber when it first arrived it was impossible to prepare my report sooner, as it was necessary, in order that the trials might have any practical value, that the woods should be in a properly workable condition, and although in order to save time I had the samples seasoned by the cool-air drying process, it was several months before they were fit for experiment.

I have sent with my report a short piece of board planed by machinery from each of the samples submitted for trial, but regret that these did not include several of the better Tasmanian woods, particularly the She-Oak, Silver Wattle, Figured Myrtle, Curly Gum, and Musk, as it is evident from the polished samples of these woods at your office that they would be valuable in the English market for cabinet work.

There can be no doubt, however, that your polished samples of Blackwood, Huon Pine, and Myrtle have been specially selected from the best figured logs, as neither of the three samples of these woods submitted to me for trial can at all compare with them in beauty of figure, and assuming that the samples you sent to me are fairly representative of their various kinds, it is certain that anyone ordering these woods in quantity from your polished samples would be greatly disappointed with the result.

I am, &c.,
(Signed) A. RANSOME.

REPORT on certain TASMANIAN WOODS furnished by the Agent-General for Tasmania for trial by Mr. A. Ransome, Stanley Works, Chelsea.

Having carefully tested the various samples of Tasmanian timbers furnished to me for that purpose, I have pleasure in giving below the results of these trials.

The woods submitted for experiment included pieces of the following timbers:—

1. Stringy bark (*Eucalyptus obliqua*).
2. Stringy gum.
3. Red myrtle (*Fagus Cunninghamii*).
4. White myrtle (*Do.* *Do.*).
5. Pine (*Dacrydium Franklinii?*).
6. Huon pine (*Do.* *Do.*).
7. Blackwood (*Acacia melanoxylon*).
8. Lightwood (*Do.* *Do.*).
9. Pencil cedar (*Do.* *Do.*).
10. Sasafras (*Atherosperma moschata*).

All these samples without exception were so wet and unseasoned that it was necessary to dry them all artificially for some months before they were in a workable condition. This operation, which explains the delay in furnishing my report, has had the effect of rendering the woods about

as dry as if they had been seasoned for three or four years by exposure to the air, and all the woods when the trials took place may therefore be considered as perfectly seasoned.

The trials embraced working the various samples with different joiners' machines, and included the operations of sawing, with circular, vertical, and hand saws; planing and moulding with revolving cutters; cutting circular mouldings, and making two or three bands from such of the woods as I thought might be suitable for cooperage work. Further trials were made with the object of testing the strength of each of the woods, the result of which is given at the end of this report. For this purpose pieces 1 inch square by 30 inches long, having been selected from the straightest and soundest portions of each piece of timber, were placed horizontally across bearers exactly 2 feet apart, and weights hung upon the centre until each sample broke, and the deflection immediately before the breaking point was reached is also given in the table.

Planed samples of the various woods as left by the cutters of the planing machine accompany this report, by which it will be seen that they are all easily worked by machinery, and it is somewhat remarkable that notwithstanding the very wet condition of all these woods when first put into the drying chamber none of them cracked in the process of seasoning. Samples of each wood [submitted to the breaking test are also sent to show the class of fracture in each case.

I assume that the samples submitted for trial may be taken as fair commercial specimens of the woods of their various kinds, but I think it well to point out that none of the Tasmanian woods I have treated exhibit the beautiful figure which is so strikingly apparent in the polished samples which I saw at your office.

Taking the samples in the order in which they are mentioned above I will now give the result of the trials in detail :—

Stringy bark (*Eucalyptus obliqua*), a very strong tough wood, with a straight grain, in appearance somewhat resembling American ash. From its great strength and toughness it is well adapted for carriage, cart, and waggon building, wheelwork, and agricultural machinery, as well as for the framing of railway carriages and trucks. It is also a valuable wood for the stronger description of building constructions, and would make excellent railway sleepers. From the peculiar strength of the fibre of the grain it will not maintain a good surface, as, even when perfectly dry, the grain rises, so as to render it impossible to polish it successfully.

Stringy Gum.—This wood bears a strong resemblance in general appearance and texture to the stringy bark last described, but the grain is crossed diagonally with long spots of a lighter shade, which would show a good figure if the wood could be polished. Stringy gum, however, is open to the same objection in this respect as stringy bark, but in a still more marked degree; for not only does the grain rise after the board is planed, but unless it is absolutely dry, fibres of the wood become detached from the surface, which renders this wood quite unfit for any but rough work.

Red Myrtle (*Fagus Cunninghamii*).—A sound, mild-working wood, of a bright pink colour, resembling English beech in grain, and could be used to advantage for all the purposes for which the best beech is employed in this country; while its superior appearance would enable it to take the place of the cheaper kinds of mahogany in wardrobes and other cabinet-work.

White Myrtle (*Fagus Cunninghamii*).—This wood closely resembles the Red Myrtle last described in texture and grain, but differs from it in colour, having a brownish-grey tint. Like the red myrtle, it could be used for all the purposes for which the best English beech is employed, but its somewhat dull and unattractive colour would preclude its being used as a substitute for mahogany.

Pine (*Dacrydium Franklinii?*).—This is a fine close-grained wood, resembling in appearance some of the descriptions of pine known in this market, but it is harder, heavier, and tougher than any of the woods of that description hitherto used in England. As from the sample submitted, it appears that the trees grow to a great size and the wood is very easy to work, it should be a favourable timber for building purposes; while its strength and toughness should make it well adapted for use in agricultural machines, and the sides and floorings of railway waggons and trucks. At the trials of the breaking strains given at the foot of this report, this wood stood a strain of 483 lbs., and the deflection before breaking was as much as 1 inch in 20 inches, which testifies a degree of strength and toughness most unusual to find in any wood of this class.

Huon Pine (*Dacrydium Franklinii*).—This is a beautifully sound and mild wood, of a light straw colour. As it is very easily worked, and frequently has a very ornamental grain, it is well adapted for first-class joinery work, making beautiful panels and mouldings, and the better figured logs should meet with a ready sale in this country for furniture and cabinet work. As it is somewhat brittle, and breaks under a comparatively small strain, it is not suitable for joists, beams, or the heavier descriptions of builders' work, and as it could not be imported into this country at a price which would compete with American pine, its sale in England would be limited.

Black Wood (*Acacia melanoxylon*).—A sound mild-working timber of a brownish colour, closely striped with streaks of various shades of a reddish brown, and frequently crossed by diagonal marks of a light golden colour. The more ornamental logs of this wood are exceedingly beautiful, and should fetch a high price in this market, where they could be used to advantage in place of the best Honduras mahogany, while the less ornamental logs would serve for the higher class of joinery work, such as counters and other shop fittings. The younger growth is well suited for cooperage work, and a barrel made from one of the pieces submitted for trial before being artificially seasoned is still quite tight, and shows no sign of shrinkage.

Light Wood (*Acacia melanoxylon*).—This is an inferior description of black wood, from which it differs mainly in being of a lighter colour, and having a somewhat more open grain. Although it will not compete with the black wood for highly ornamental cabinet work, it could be used in the place of cheap mahogany for wardrobe backs and other similar work.

Pencil Cedar (*Acacia melanoxylon*).—This, like the light wood last described, is very similar in grain and growth to the black wood, and the fact that the same Latin name of *Acacia melanoxylon* is common to this and to the two woods last described is sufficient evidence that they are varieties of the same tree. If pencil cedar could be imported into this country at a price that would enable it to compete with the cheaper descriptions of mahogany and cedar it would meet with a ready sale for the purposes for which these woods are now almost exclusively used.

Sasafras (*Atherosperma moschata*).—This is a light wood of no commercial value, and appears to be only suitable for the commoner descriptions of packing cases or for firewood. The brown marks which largely pervaded the piece sent for trial are, I think, due to decay, and are probably the result of the timber having been felled at the wrong season, or having been left too long on the ground after it had been felled. For the reason above named it would never pay to import sasafras into this country.

(Signed) A. Ransome.

23rd November 1888.

Table showing the result of the Breaking Trials of the Ten kinds of Tasmanian Timbers mentioned in the above Report.

No.	Name.	Dimensions of piece broken.	Distance between bearers.	Breaking Weight.	Deflection at Breaking Point.
		Inches.	Inches.	Lbs.	Inches.
1	Stringy Bark	30 by 1	24	602	$\frac{7}{8}$
2	Stringy Gum	Do.	Do.	336	1
3	Red Myrtle	Do.	Do.	452	$1\frac{7}{8}$
4	White „	Do.	Do.	459	$1\frac{3}{8}$
5	Pine	Do.	Do.	483	$1\frac{1}{2}$
6	Huon Pine	Do.	Do.	203	$1\frac{1}{4}$
7	Blackwood	Do.	Do.	518	$1\frac{3}{4}$
8	Lightwood	Do.	Do.	378	$2\frac{1}{8}$
9	Pencil Cedar	Do.	Do.	476	$1\frac{7}{8}$
10	Sasafras	Do.	Do.	280	1

XCIV.—LILY FLOWERS AND BULBS USED AS FOOD.

It is well known that in countries where lilies are indigenous and plentiful they are sometimes utilised as food plants. For some years the dried flowers of certain lilies have formed a considerable article of trade in China, and in the Consular Report on the trade of Chinkiang for the year 1886, p. 10, it is stated :—

"The export of lily flowers has increased from 7,033,000 lbs. to 7,677,622 lbs., and is the largest export for many years. The crop was a very good one, and prices were, during most of the year, remunerative. Not more than two-tenths is consumed here ; the rest goes south, where it is used to flavour soup. The cultivation of this plant yearly increases in the north of this province."

In a letter addressed to Kew by Mr. Pelham L. Warren, Consul at Taiwan, dated August 16, 1883, the following information is given respecting the source of lily flowers used in China :—

"The lily flowers mentioned in Mr. Watter's Consular Report, concerning which you ask for information in your note of the 6th June last, are the dried blossoms of *Hemerocallis graminea* and *Lilium bulbiferum*. They are used by the Chinese for flavouring soups, and also eaten as a vegetable. Lily flowers are also said to be efficacious in

pulmonary affections, and to have tonic properties. I enclose a small specimen of those imported here. Hankow is the chief place of export in China, and large quantities also come from Japan."

The specimen forwarded by Mr. Warren was evidently the flower of *Hemerocallis*, and Mr. Baker saw no reason why it should not be *H. graminea*, Andr. (H. minor, *Mill*) the Day Lily distinguished from the true lilies by its shortly trumpet-shaped perianth. There were no specimens of the flowers of *Lilium bulbiferum*.

Among the Japanese the lilies are much used for food, according to Professor Penhallow, who gives the following interesting account of their uses in the *American Naturalist*, vol. xvi., p. 119:—"Various "species of *Lilium* abound throughout the forests, and all those which "furnish a sufficiently large bulb are utilised as a source of farinaceous "food. Early in autumn the women may be seen returning to "their villages loaded with bulbs. These are thoroughly crushed in "a large wooden mortar, after which the starch is separated from the "cellular mass by repeated washing. The former is then hung up in "bags for winter use, while the latter is dried in round perforated "cakes, somewhat resembling miniature mill-stones, and hung up to "dry."

Efforts were made to procure specimens of lily cakes from Japan for the Museums of Economic Botany at Kew, and as shown in the following official correspondence not only lily cakes, but other specimens were obtained, which are now in the Kew Museums.

The Hon. Power Le Poer Trench to Foreign Office.

My Lord, Tokio, March 6th, 1884.

Since the receipt of your Lordship's despatch, No. 100, of the 25th September last, I have been using my best endeavours to obtain for the Director of the Royal Gardens, Kew, specimens of the lily bulb cakes, said to be used as food by the Japanese, but in spite of all the inquiries I have made, I have been unable to find them either in Tokio or in Yokohama.

Mr. Woolley, however, who was passing through Yokohama in December last, on his way back to his post, undertook to inquire whether they were procurable in some town or village in the northern part of Japan, and the month before last he wrote that he could not find any in Hakodate, and that the Japanese there said they had never seen such things. He was inclined to think that Professor Penhallow had mistaken them for *Fu* cakes, which are made of wheat and hung up in shops for sale, and that those he referred to were only to be found in the Aino country. He had, however, written to a Mr. Brooks, a botanist attached to the Agricultural College at Sapporo, and had asked him to try and obtain some of the specimens required.

On the 1st instant I received a further letter from Mr. Woolley, saying that he had at last succeeded in obtaining the cakes asked for, and he forwarded me a small parcel containing a specimen of the smaller kind, the larger ones being, he said, of an awkward size for transport, and more likely to get broken.

I have now the honour to forward to your Lordship a box containing the four specimens of the cakes, together with a description of the same.

* * * * *

I have, &c.

The Earl Granville, K.G., &c. &c. &c. (Signed) P. Le Poer Trench.

[Enclosure.]

Description of specimens illustrative of the economic use of the bulbs of *Lilium cordifolium*: Uba-yuri (Japanese name), Kiu (Aino name), forwarded for the Museums of the Royal Gardens, Kew.

1. Fibre from which starch has been partially extracted.

After the bulbs have been well washed and soaked in water for two days and nights they are pounded in a wooden mortar, and then transferred to a tub filled with water. The mass is thoroughly kneaded with the hands, and allowed to stand for a night to enable the starch to settle, after which the cellular mass is taken out and dried.

2. Cakes made of the above fibre, by pounding it in a mortar with a little water, and then kneading the mass into shape with the hands. The cakes are hung up to dry in the Aino huts. The discolouration is caused by smoke. The cakes are not eaten by the Japanese. The Ainos boil and eat them either "*au naturel*" or mixed with rice. (The cakes vary in size, the large ones being over one foot in diameter).

3. Starch made by the Japanese from Uba-yuri bulbs. That made by the Ainos is similar but coarser.

4. Confectionery made by Japanese from Uba-yuri.

XCV.—P'U-ÊRH TEA.

A tea under this name appears as an article of commerce in the province of Yun-nan, in the south-west of China, near the boundaries of Burma and Siam. It is said to possess medicinal and invigorating properties, and to be specially used to aid digestion after heavy meals. A specimen of P'u-êrh tea was communicated to the Kew Museums by Mr. Lockhart in 1858, and another by Mr. John Fryer in 1879. Mr. Fryer states that "this tea is not to be purchased in any part of the east of "China. It is sent as a tribute to Pekin and can only be obtained "when brought by officials from Yun-nan. The tea is made up into "cakes of a lenticular shape about eight inches in diameter and well "pressed."

In a paper read before the Royal Geographical Society, by Mr. Colquhoun, November 13, 1882, it is mentioned that "the most "celebrated tea in China comes from a part of the Shan country, from "a district called I-Bang mainly, situated five days south of the Yun-nan "frontier. This tea, which by a misnomer is called P'u-êrh tea, from "the name of a prefecture close by, is sent to the town of Ssŭ-mao for "distribution. From that place it is forwarded to Pekin and the "northern provinces; by caravans to the Yangtsze, thence by river to "Shanghai, and from that port northwards."

In the same paper Mr. Colquhoun expresses the hope that British trade would some day tap the southern parts of Yun-nan, and that "this celebrated tea would become a staple article of export." Commenting on this latter statement, Mr. G. M. H. Playfair, then Her Majesty's Consul at Pakhoi, in a letter to Kew dated 20th February 1883, points

out "that Mr. Colquhoun was evidently under the impression that " P'u-êrh tea is akin to the Souchongs and Boheas of the breakfast " table but of superior quality, like the delicate growths reserved for " Imperial use. This opinion is, however, erroneous. P'u-êrh tea is " certainly celebrated, but not in that way. Although produced, as I " understand, by a *Thea* its use is medicinal. The Chinese drink a cup " of it after a heavy meal as a digestive ; even two cups might perhaps " be indulged in, but to take three would be productive of inconvenience, " and four positively dangerous. I am of course merely quoting native " opinion. This much appears certain, the article is not fitted for the " breakfast table, and is not likely to be exported to foreign countries " except as a drug, and never in large quantities."

The specimens of P'u-êrh tea in the Kew Museums consist of loose tea contributed by Mr. Lockhart in 1859, and of cake-tea or brick-tea contributed in 1879 by Mr. Fryer. In neither specimen do the leaves appear like ordinary tea in general character. They are made up of large and small leaves indiscriminately mixed together. Some are flat and broken, others are slightly curled, while only a few of the youngest leaves have the appearance of tea as seen in this country. In colour they are rusty-brown, changing to black according as the upper or lower side of the leaf is exposed. From the colour and the character of the decoction it is evident that they have undergone some process of fermentation, and they still retain some fragrance, although this has now only a faint resemblance to good commercial tea. A decoction obtained from the brick-tea presented by Mr. Fryer is of a bright rich colour, with a delicate aroma, but possessing a peculiar bitter flavor. It is possible that the Chinese value this tea on account of this bitterness. From an examination of the soaked leaves, which vary from 1 to 3 inches in length, there can be little doubt they are derived from some species of Camellia closely allied to the Assam tea *Camellia theifera*, Griff. The young leaves are copiously covered with tawny silky hairs, and these hairs are retained to some extent even in the larger leaves on the under side along the mid-rib and secondary veins.

In general outline, as also in the character of the venation and in the serratures along the edge, the leaves are indistinguishable (except perhaps in the difference in colour between the upper and lower sides) from what might be expected from Assam tea treated in the same manner.

At present we have nothing but the leaves to go by. In the absence of flowers and fruit it is impossible to determine the plant yielding P'u-êrh tea. The indications at present are that it is very near if not identical with the wild Assam tea-plant. This, it must be remembered, would be unfamiliar to the Chinese, and hence it is natural to suppose that P'u-êrh tea is regarded by them as something distinct from the ordinary tea, and esteemed as a nervous stimulant and as an aid to digestion on account of its greater richness in theine, in the same way as the Bolivians use a decoction of Coca leaves.

From Mr. Colquhoun's description of the locality, it is clear that it does not grow in China, but is obtained from the Shan States of Siam, and chiefly from the neighbourhood of the town of I-Bang. It is called P'u-êrh tea merely because this is the first Chinese town at which it is received after crossing the Yun-nan frontier. These Shan States have never been fully explored, and it is probable that they contain numerous

valuable plants not yet known to science. It will be remembered that the valuable Siam Benzoin, of the source of which we are still in doubt, is obtained, according to Captain Hicks, of Bangkok, "from the northern "Laos States, but grows luxuriantly in Suang-Rabang, and all along "the belt of mountains in this province." Suang-Rabang (or Luang-Phrabang) appears to be only a few days' journey south of I-Bang, whence P'u-êrh tea is obtained. Hence any traveller in this region who would give attention to the subject might be able to solve problems connected with two most interesting plants which have exercised the minds of botanists for the last 30 years.

This summary of information respecting P'u-êrh tea, which exhausts all that known of it at Kew, has been suggested by the steps lately taken by the Government of India to obtain seeds of the plant from China for experimental cultivation in various parts of India. The action of the Government of India appears to have been due in the first instance to a communication received by it from Her Majesty's Consul at Shanghai, forwarding a sample of "the famous P'u-êrh tea from the south of Yun-nan." This sample was divided between the Economic Museum at Calcutta and the Governments of Bengal, the Punjab, and the North-West Provinces. A resolution (No. 255, dated the 8th Sept. 1879) was placed on record by the Government of India deciding to ask the Consul at Shanghai to furnish further particulars in connexion with the growth and manufacture of P'u-êrh tea. The receipt of the sample was also communicated to the *Indian Tea Gazette* and *Indian Agriculturist*, and in the latter paper for October 1879 it is stated that this tea is "highly prized at the Court of Pekin, and is also esteemed by the Chinese generally for its invigorating properties."

Seed of P'u-êrh tea appears to have been sent from China to India on two occasions, and in each case the result, as far as can be gathered from official records, has been a failure. This was no doubt owing to the seeds having lost their vitality in the long journey from the Shan States to Shanghai and again from Shanghai to India. It is the common experience of planters that tea seed very soon loses its vitality. Seed kept even for a few weeks, unless packed in soil, becomes unsound and incapable of germination. An account of the last attempt to introduce seed of the P'u-êrh tea plant to Madras is given in the Proceedings of the Government of Madras, Revenue Department, No. 695, dated 1st October 1888. The further steps to be taken to obtain seeds and specimens of this plant may very well be attempted either through Bangkok, as the district in which P'u-êrh tea is found is tributary to Siam, or through the adjoining Shan States of Burma. At the same time, as already suggested to the India Office by Kew, it is very desirable and important to obtain more precise information and complete sets of specimens of leaves, flowers, and fruit of the Siam Benzoin, a plant which is known to exist, as shown in a preceding paragraph, within the same geographical area as P'u-êrh tea.

M.S.del.et lith.

Pachyrrhizus angulatus, Rich.

XCVI.—SHORT-PODDED YAM-BEAN.

(*Pachyrhizus angulatus*, Rich.)

With Plate.

In the *Kew Bulletin* for January last, p. 17, and again in the *Bulletin* for March last, p. 62 (with Plate), an account was given of the Yam-bean (*Pachyrhizus tuberosus*, Spreng.). This is a valuable economic plant, yielding tuberous edible roots as well as pods, which, served like French beans, are an admirable vegetable for use in tropical countries. Hitherto, the plant had been included under *Pachyrhizus angulatus*, Rich. It is a question how far really it may be distinct, but Professor Oliver is of opinion that it possesses such well-marked characteristics that it deserves a distinct name for cultural purposes, and it has been decided to retain for it the specific name originally given it by Lamarck and adopted by Sprengel.

In order to form a means of comparison between the two plants a figure of *Pachyrhizus angulatus*, Rich., prepared for the *Icones Plantarum*, is here reproduced by permission of the Bentham Trustees.

Pachyrhizus angulatus, Rich.; DC. Prod., ii., 402. Roots tuberous. Stem herbaceous twining, clothed with short hairs, sometimes smooth. Leaves pinnately three-foliolate with stipellate lobed leaflets, stipules deltoid or ovate-lanceolate short; leaflets large membranous hairy or glabrous distantly toothed, base of lateral leaflets strongly oblique, of the terminal leaflets broadly cuneate, stipels subulate. Racemes loose $\frac{1}{2}$–1 foot, often with short somewhat erect branches at the base, bracteoles setaceous. Calyx, five-lobed, hairy. Corolla, reddish or violet. Legume 3–5 inches long, 6–8 lines broad, deeply depressed between the seeds, somewhat hairy.

Widely cultivated in the tropics of both hemispheres, "probably of Central American origin," Bentham, in Martius, *Fl. Bras.* (*Papilionaceæ*), 199, Pl. 53.

A starch is made from the tubers of this plant, or the tubers when young are eaten as in the case of *P. tuberosus*. In Fiji, where the plant is known according to Seemann as Yaka or Wayaka, a tough fibre is obtained from the twining stems, used in making fishing nets.

In a recent letter received from Dr. Trimen, F.R.S., Director of the Botanic Gardens, Ceylon, to whom Kew is indebted for herbarium specimens of both species of Yam-bean, it is stated:—

"The ordinary *Pachyrhizus angulatus* (from Java) is now cropping profusely here. You will be interested to know that the pods of this cannot be well used as a vegetable like those of the West Indian species [*Pachyrhizus tuberosus*]. The pods are smaller and more hairy, and the coolies tell me that they cannot eat them in their curries without setting up a diarrhœa, due no doubt to the irritation of the hairs."

Fig. 1, calyx and stamens; 2, vexillum; 3, wing; and 4, keel-petal; 5, pistil; 6, seed. *Enlarged.*

XCVII.—LIST of the STAFFS of the ROYAL GARDENS, Kew, and of Botanical Departments and Establishments at Home, and in India, and the Colonies, in Correspondence with Kew.

Royal Gardens, Kew:—

Director	W. T. Thiselton Dyer, C.M.G., F.R.S., F.L.S.
Assistant Director	D. Morris, M.A., F.L.S.
Clerks	John Bliss and F. W. P. French.
Keeper of Herbarium and Library	Prof. Oliver, F.R.S.
Principal Assistant	J. G. Baker, F.R.S.
Mycologist	Dr. M. C. Cooke, M.A., F.L.S.
Assistant for India	W. B. Hemsley, A.L.S.
Assistant	N. E. Brown, A.L.S.
„	R. A. Rolfe, A.L.S.
„	C. H. Wright.
Attendant	J. T. Jeffrey.
Curator of Museums	John R. Jackson, A.L.S.
Office Assistant	J. M. Hillier.
Préparateur	G. Badderley.
Curator of the Gardens	George Nicholson, A.L.S.
Assistant Curator (Tropical Department).	William Watson.

Foremen:—

Arboretum	William Truelove.
Herbaceous Department	Daniel Dewar.
Greenhouse and Ornamental Department.	F. Garrett.
Temperate House (Sub-tropical Department).	W. Bean.

Bangalore.—Government Botanic Gardens, Lal Bagh:—

Superintendent	Mr. John Cameron, F.L.S.

Barbados.—Dod's Reformatory, Botanical Station:—

Superintendent	Mr. J. R. Bovill.

Bombay.—Horticultural Gardens and Parks:—

Oodeypore	Superintendent	Mr. T. H. Storey.
Poona (Ghorpuri)	„	Mr. W. Shearer.
	Lecturer on Botany, College of Science.	Mr. E. M. Woodrow.

Bombay.—Municipal Garden:—

Superintendent	Mr. G. Sarstensen.

British Guiana.—Botanic Gardens :—

Georgetown -	Superintendent and Government Botanist.	Mr. G. S. Jenman, F.L.S.
	Head Gardener -	Mr. J. Waby.
	Second „ -	Mr. R. Ward.
Berbice - -	Keeper - -	Mr. Richard Hunt.

Calcutta.—Royal Botanic Gardens Department :—

	Superintendent -	Dr. George King, LL.D., F.R.S., F.L.S.
Seebpore - -	Curator of Herbarium	Dr. David Prain, F.L.S., F.R.S.E.
	„ Garden -	Mr. W. McHardy.
	Assistant - -	Mr. R. L. Proudlock.
Mungpoo -	Superintendent, Government Cinchona Plantations.	Dr. George King, LL.D., F.R.S., F.L.S.
	Resident Manager -	Mr. J. A. Gammie.
	1st Assistant -	Mr. R. Pantling.
	2nd „ - -	Mr. J. Parkes.
	3rd „ -	Mr. G. Gammie.
Darjeeling - -	Curator, Lloyd Botanic Garden.	Mr. W. A. Kennedy.

Cambridge.—University Botanic Gardens :—

	Professor - -	Charles C. Babington, F.R.S., F.L.S.
	Secretary to Botanic Garden Syndicate.	Dr. Francis Darwin, F.R.S., F.L.S.
	Curator - -	Mr. R. Irwin Lynch, A.L.S.

Canada :—

Ottawa - -	Dominion Botanist -	Prof. John Macoun, F.R.S.C., F.L.S.
	Director of Government Experimental Farms.	Prof. Wm. Saunders, F.R.S.C., F.L.S.
Montreal - -	Director, Botanic Garden.	Prof. Penhallow, B.Sc.

Cape Colony.—Gardens and Public Parks :—

Cape Town -	Director - -	Prof. MacOwan, F.L.S.
	Head Gardener -	Mr. H. J. Chalwin.
Grahamstown -	Curator - -	Mr. Edwin Tidmarsh.
Port Elizabeth (St. George's Park) :—		
	Superintendent -	Vacant.
King Williamstown	Curator - -	Mr. T. G. Sim.
Graaf Reinet -	„ - -	Mr. J. C. Smith.
Mitenhage - -	„ - -	Mr. H. Fairey.

Ceylon.—Royal Botanical Gardens Department :—

	Director - -	Dr. H. Trimen, F.R.S., F.L.S.
Peradeniya -	Head Gardener -	Mr. P. D. G. Clark.
	Clerk and Foreman -	Mr. J. A. Ferdinandus.
	Draughtsman - -	Mr. W. de Alwis.
Hakgala -	Superintendent -	Mr. W. Nock.
	Clerk and Foreman -	Mr. H. M. Alwis.
Henaratgoda -	Conductor - -	Mr. A. de Zoysa, Muhandiram.
Anuràdhapura -	„ - -	Mr. T. de Silva, Arachchi.
Badulla - -	„ - -	Mr. D. Guneratne.

Dominica.—Botanical Station :—

Curator (temporary) -	Mr. J. Hartley.

Dublin.—Glasnevin Botanic Gardens :—

Scientific Superintendent.	Dr. McNab, F.L.S.
Curator - -	F. W. Moore, Cor. Mem. R.H.S.

Trinity College Botanic Gardens :—

Professor - -	Dr. E. Perceval Wright, F.L.S., Sec. R.I.A.
Curator - -	Mr. F. W. Burbidge, F.L.S.

Edinburgh.—University Botanic Garden :—

Professor - -	Dr. Isaac Bayley Balfour, F.R.S., F.L.S.
Curator - -	Mr. Robert Lindsay, F.R.H.S.

Fiji.—Botanic Station :—

H. E. Sir John B. Thurston, K.C.M.G.

Glasgow.—University Botanic Gardens :—

Professor - -	Dr. F. O. Bower, F.L.S.
Curator - -	Robert Bullen, Cor. Mem. R.H.S.

Gold Coast.—Botanic Station :—

Curator - -	—

Grenada.—Botanical Garden :—

Curator - -	Mr. Wm. Elliott.

Hong Kong.—Botanical and Afforestation Department :—

Superintendent -	Mr. Charles Ford, F.L.S.
Assistant Superintendent.	Mr. A. Westland.

Jamaica.—Public Gardens and Plantations Department :—

	Director - -	Mr. William Fawcett, B.Sc., F.L.S.
Hope Gardens -	Superintendent -	Mr. W. Harris.
Castleton Garden	„ -	Mr. W. Cradwick.
Cinchona (Hill) Garden.	„ -	Vacant.
Kingston Parade Garden.	„ -	Mr. W. Campbell.
King's House Garden.	„ -	Mr. E. Campbell.
Bath - -	Overseer - -	Mr. W. Groves.

Lagos.—Botanical Station :—

	Superintendent -	Mr. James McNair.

Madras.—Botanical Department :—

Ootacamund -	Government Botanist and Director of the Government Cinchona Plantations.	Mr. M. A. Lawson, M.A., F.L.S.
	Curator - -	Mr. A. Jamieson.

Madras.—Agri Horticultural Society :—

	Secretary - -	Sir Chas. Lawson.
	Superintendent -	Mr. F. M. Gleeson.

Malta.—Botanical Garden :—

	Director - -	Dr. Gulia.

Mauritius.—Department of Forests and Botanical Gardens :—

Pamplemousses -	Director - -	Mr. John Horne, F.L.S.
	Assistant - -	Mr. Wm. Scott.
Curepipe - -	Overseer.	—

Natal.—Botanic Gardens :—

Durban - -	Curator - -	Mr. John Medley Wood, A.L.S.
Pietermaritzburg	„ - -	Mr. R. W. Adlam.

New South Wales.—Botanic Gardens :—

Sydney - -	Director - -	Mr. Charles Moore, F.L.S.

New Zealand :—

Wellington.—Colonial Botanic Garden :—

	Director - -	Sir James Hector, K.C.M.G., F.R.S.
Auckland -	Curator, Domain Garden.	Mr. Wm. Goldie.

Niger Territories.—Botanical Garden :—

Asaba - -	Head Gardener -	Mr. Geo. Woodruff.

Northern India.—Botanical Department :—

Saharunpur -	Director - -	Mr. J. F. Duthie, B.A., F.L.S.
	Superintendent of Garden.	Mr. W. Gollan.
Lucknow - -	Superintendent -	Mr. M. Ridley.
Cawnpore -	Assistant Director in charge of Experimental Station.	Sayyed Mahammad Husain.

Oxford.—University Botanic Garden :—

	Professor - -	Dr. Sydney H. Vines, F.R.S., F.L.S.
	Curator - -	Mr. William Baker.

Queensland.—Botanic Gardens :—

Brisbane - -	Colonial Botanist -	Mr. F. M. Bailey, F.L.S.
	Head Gardener -	—
	Overseer - -	Mr. J. Cameron.
Acclimatization Society's Gardens	Secretary and Manager	Mr. Wm. Soutter.
Rockhampton -	Superintendent -	Mr. J. S. Edgar.

St. Lucia.—Botanical Station :—

	Curator - -	Mr. John Gray.

South Australia.—Botanic Gardens :—

Adelaide - -	Director - -	Dr. Schomburgk, Ph.D.
Port Darwin -	Curator - -	Mr. Maurice Holtze.

Straits Settlements.—Gardens and Forest Department :—

Singapore - -	Director - -	Mr. H. N. Ridley, M.A., F.L.S.
	Head Gardener -	Mr. Walter Fox.
Penang -	Assistant Superintendent.	Mr. C. Curtis.
Malacca - -	„ -	Mr. R. Derry.

Tasmania.—Botanical Gardens :—

Hobart Town -	Superintendent -	Mr. F. Abbott.

Trinidad.—Royal Botanical Gardens :—

	Superintendent -	Mr. John H. Hart, F.L.S.
	Assistant - -	Mr. W. E. Broadway.

Victoria :—

	Government Botanist	Baron Sir F. von Mueller, F.R.S., K.C.M.G.

Melbourne.—Botanical Gardens :—

	Director - -	Mr. W. R. Guilfoyle, F.L.S.